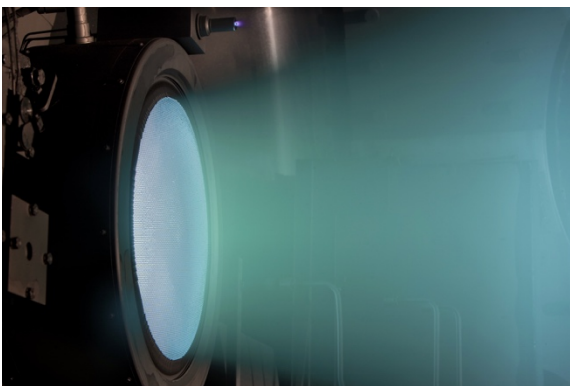


# NASA's Evolutionary Xenon Thruster–Commercial (NEXT–C)

## NEXT–C Overview

NASA's Evolutionary Xenon Thruster – Commercial (NEXT–C) project is the next phase in the development of the NEXT thruster and Power Processing Unit (PPU). NASA's Planetary Science Division is funding the design, fabrication, and test of two flight-qualified NEXT–C thrusters and PPUs for use on a future NASA mission. NEXT has very high fuel efficiency and flexible operations making it ideal for many classes of science missions.



The technology that led to NEXT–C was developed under the NASA In-Space Propulsion Technology project. NEXT was developed for a wide range of NASA robotic science missions, including near-term New Frontiers and Discovery class mission opportunities. Several missions are enhanced or enabled by NEXT over state-of-art electric propulsion and chemical alternatives. High fidelity NEXT hardware was produced by the government/industry team, including a flight prototype model (PM) thruster, an engineering model (EM) power processing unit (PPU), EM propellant management assemblies, a breadboard gimbal, and control unit simulators.

## NEXT Long Duration Test Results

The NEXT Long Duration Test (LDT) was operated for over 8 years. The thruster greatly exceeded its design goals. The thruster demonstrated over 918 kg of xenon throughput over 51,184 hours of operation. This translates to 35.5 MN-sec of total impulse, which is a world record for any electric propulsion thruster. The test was voluntarily terminated in 2014 to conduct extensive post-test inspections of the thruster. Post-test inspections have been completed and a full report will be completed in 2018.

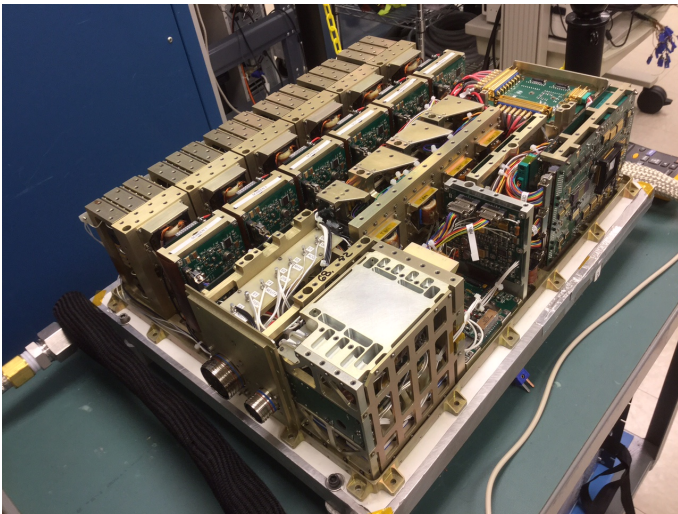


## NEXT PPU Maturation

Reviewer feedback collected through the NEXT Close-Out Review and Technology Readiness Level assessments conducted by multiple mission centers was consistent. The thruster was ready to build a flight version, but the PPU needed more work.

A key outcome from the close-out review was the formation of a multi-organization team to define a PPU maturation plan. The technical team assessed verification gaps and PPU design weaknesses that needed to be addressed. The team completed an Electrical, Electronic and Electromechanical (EEE) parts and high voltage component assessment, and reviewed and updated PPU requirements in support of the NEXT-C PPU development.

A prototype PPU has been built and has undergone a full set of environmental proto-qualification level tests, including shock and vibration, thermal vacuum, and Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC).



## NEXT-C Thruster Development

The NEXT-C thruster can be throttled from approximately 25-235 mN. Depending on the throttle condition, the thruster specific impulse ranges from 1400-4200 sec. The NEXT-C thruster is powered by a PPU with an input power up to 7.4 kW.

For the past 2 years, the team has been testing the Dev-C thruster, which is a modification of the PM thruster resembling the NEXT-C flight design. These tests included several hot-fire tests, an abbreviated system integrated test with the thruster and PPU, and shock and vibration tests. The abbreviated system integrated system test was the first time a NEXT thruster and PPU had operated together, where the PPU was controlling the thruster. This test will be repeated for a longer duration in the near future.

The goal of this effort was to make design updates that retained the validity of the long duration life test results and ensured a more structurally capable thruster that can be more easily manufactured and integrated into a spacecraft.

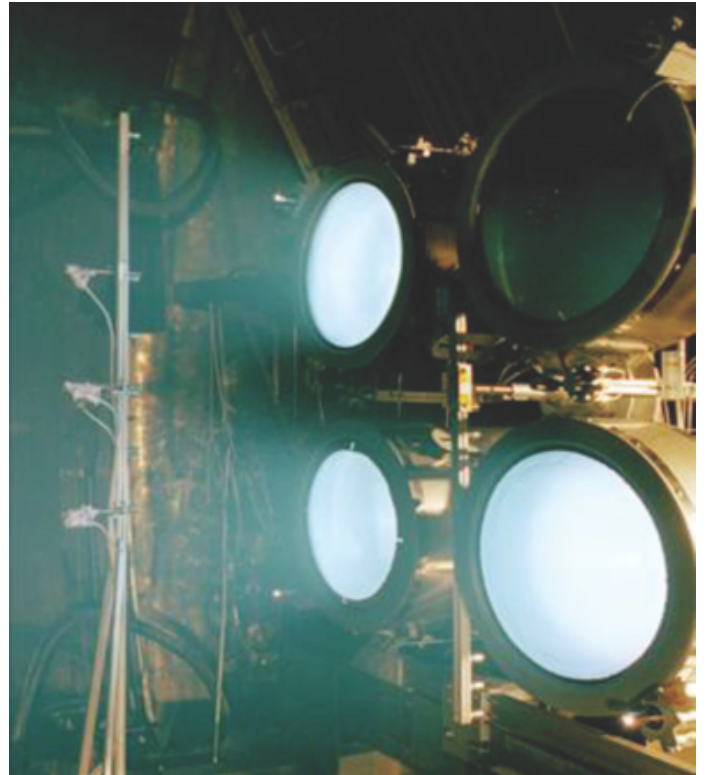
## NEXT-C Status

In September, 2014, NASA Glenn Research Center issued a Request for Proposals (RFP) for the development, fabrication, and test of two flight-qualified NEXT thrusters and PPUs. This development is referred to as the NEXT-C project. Aerojet Rocketdyne was awarded the contract with ZIN Technologies as a major subcontractor in March, 2015.

NEXT-C successfully completed System Requirements Review in July 2015 and Preliminary Design Review in February 2016. Both thruster and PPU work are progressing well and lessons learned from the NEXT technology development project have been incorporated into the NEXT-C design. The project nearly completed all development testing and passed CDR in April 2018 contingent on

completing the remaining development testing. NEXT-C plans to deliver two flight thrusters and PPUs to support the DART mission and a future Air Force technology demonstration mission.

In addition to developing the two flight thrusters and PPUs for near-term use, NASA has a goal of NEXT becoming a commercial product for purchase by NASA and non-NASA customers. Upon successful completion of the NEXT-C project, the NEXT-C system will be the highest power ion engine qualified to date, enabling support to missions with varying gravitational fields, long life requirements and high delta-V.



<https://next-c.grc.nasa.gov/>



For more information:  
Contact Terry O'Malley at  
(216) 433-2960  
[tfomalley@nasa.gov](mailto:tfomalley@nasa.gov)

National Aeronautics and Space Administration

Glenn Research Center  
Cleveland, Ohio 44135

[www.nasa.gov](http://www.nasa.gov)